

REMARKS

As a preliminary matter, Applicants' representative would like to thank the Examiner for courtesies extended in the telephone conference conducted on December 30, 2004, in which the Examiner granted a personal interview in the present application to discuss the Amendments and traversal arguments as submitted herewith. The personal interview will be conducted on January 11, 2005 at 9:00 AM by the Examiner and the undersigned attorney.

Claims 1-3 and 7-21 are all the claims presently pending in the application.

Claims 1-3 have been elected for prosecution. Claims 4-6 are canceled without prejudice or disclaimer as being directed to a non-elected invention.

Claims 1-3 have been amended merely to make editorial changes in conformance with U.S. Patent practice. Claims 7-21 have been added to provide more varied protection for the features of the elected invention of the present application as disclosed in the original specification and drawings. No new matter is added.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-3 stand rejected under 35 U.S.C. § 112, second paragraph.

With respect to the prior art rejections, claims 1-3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Yamanaka (U.S. Publication No. 2003/0013280). Claims 1-3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Washio et al. (U.S.

Patent No. 6,600,178; hereinafter “Washio”). Claims 1-3 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ito et al. (U.S. Patent No. 6,770,519; hereinafter “Ito”).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

An exemplary aspect of the claimed invention, as defined for example, by independent claim 1, is directed to an electrode for a p-type Group III nitride compound semiconductor, including a film including polycrystalline metal.

In the conventional devices the contact resistivity of the electrode generally is high and it generally is impossible to obtain an ohmic junction when metal is formed simply on the semiconductor surface.

The claimed invention, on the other hand, solves the problems with the conventional devices by addressing the substance of the compound semiconductor/metal boundary and the relation with the metal boundary structure. The claimed invention provides an electrode having a lower contact resistance to p-type group III nitride compound semiconductor than conventional electrodes. Moreover, the electrical characteristics of the electrode according to the claimed invention are improved greatly (e.g., see Abstract). The claimed invention reduces the height of the Schottky barrier between the compound semiconductor and the metal by the strong orientation force of the metal, such that the value of contact resistance in the boundary between the p-type Group III nitride compound semiconductor and the metal can be reduced greatly (e.g., see specification at page 6, lines 12-18).

II. THE 35 U.S.C. §112, SECOND PARAGRAPH REJECTION

Claims 1-3 stand rejected under 35 U.S.C. §112, second paragraph. Particularly, the Examiner rejects these claims for somewhat similar reasons as the drawing objections set forth below. That is, the Examiner alleges that the features of claims 1-3 are not shown in the drawings.

As mentioned above, Applicants request entry of new Figure 6, which exemplarily shows the elements defined by original claims 1-3 (i.e., an electrode comprising a film including polycrystalline metal), and as described in the original disclosure at page 7, lines 8-25, and page 8, lines 1-13. Applicants submit that such a new figure overcomes the Examiner's rejection under 35 U.S.C. § 112, as well as the drawing objections set forth below.

Therefore, the Examiner is requested to withdraw the rejection under 35 U.S.C. § 112, and also to acknowledge and approve the new Figure 6.

The specification corresponding is amended to identify the reference numerals of new Figure 6.

III. THE PRIOR ART REJECTIONS

A. The YAMANAKA Reference

Claims 1-3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Yamanaka.

The Examiner alleges that Yamanaka teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by Yamanaka.

Yamanaka discloses a phosphorous-doped polycrystalline silicon film 15 used for a gate electrode material (e.g., see Yamanaka at page 28, paragraph [0407] and Figure 3(6)).

In comparison, independent claim 1 recites:

[a]n electrode of a p-type Group III nitride compound semiconductor light-emitting device, comprising:
a film including a polycrystalline metal (emphasis added).

Thus, Yamanaka discloses only that the silicon film has a polycrystalline structure, not that the electrode includes a polycrystalline metal film, as claimed in claim 1.

Indeed, Yamanaka does not even address the problems which are addressed and solved by the claimed invention. That is, Yamanaka does not even mention or address any of the problems associated with the substance of the compound semiconductor/metal boundary and the relation with the metal boundary structure, according to the present invention.

Moreover, Yamanaka does not even mention lowering the contact resistance of an electrode to p-type group III nitride compound semiconductor, improving the electric characteristics of the electrode, or reducing the height of the Schottky barrier between the compound semiconductor and the metal by the strong orientation force of the metal, such that the value of contact resistance in the boundary between the p-type Group III nitride compound semiconductor and the metal can be reduced greatly, as provided by the claimed device according to the present invention (e.g., see specification at page 6, lines 12-18).

Therefore, Applicants respectfully submit that there clearly are elements of the claimed invention that are not taught or suggest by Yamanaka. Accordingly, the

Examiner respectfully is requested to withdraw this rejection and permit these claims to pass to allowance.

B. The WASHIO Reference

Claims 1-3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Washio.

The Examiner alleges that Washio teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by Washio.

Washio discloses a bipolar transistor using silicon/germanium as a base layer (see Washio at column 1, lines 5-10). Particularly, Washio discloses a base lead electrode 31 comprising polycrystal silicon and a single crystal silicon/germanium layer 51 (e.g., see Washio at column 16, lines 26-33 (paragraph [106]); emphasis added).

As mentioned above, independent claim 1 recites “[a]n electrode... comprising: a film including a polycrystalline metal” (emphasis added).

Thus, Washio only discloses that the silicon and silicon/germanium layer 51 have polycrystal structures, not that an electrode includes a polycrystalline metal film, as claimed in claim 1.

Moreover, Washio also does not address the problems which are addressed and solved by the claimed invention. That is, Washio does not even mention or address any of the problems associated with the substance of the compound semiconductor/metal boundary and the relation with the metal boundary structure, according to the present invention.

Therefore, Applicants submit that there are elements of the claimed invention that are not taught or suggest by Washio. Accordingly, the Examiner respectfully is requested to withdraw this rejection and permit these claims to pass to allowance.

C. The ITO Reference

Claims 1-3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Ito.

(Applicants respectfully note that Ito was filed on October 3, 2002, which is prior to the filing date of October 29, 2003 of the present application. On the other hand, Ito was published on January 29, 2004, and issued as a U.S. Patent on August 3, 2004, which are after the filing date of the present application. Thus, Ito is available as prior art only under 35 U.S.C. § 102(e), not 35 U.S.C. § 102(b).)

The Examiner alleges that Ito teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by Ito.

As mentioned above, independent claim 1 recites “[a]n electrode... comprising: a film including a polycrystalline metal” (emphasis added).

In comparison, Ito discloses a gate insulating layer upon a single crystal semiconductor substrate to form a gate electrode made from a polycrystal conductive film upon the gate insulating layer. Ito discloses that gate electrode 4 is made from a polycrystal silicon (e.g., see Ito at column 4, lines 57-67; paragraph [0033]; emphasis added).

Thus, Ito clearly does not disclose or suggest “[a]n electrode... comprising: a film including a polycrystalline metal” as defined by independent claim 1 (emphasis added).

Therefore, Applicants submit that there are elements of the claimed invention that are not taught or suggest by Ito. Accordingly, the Examiner respectfully is requested to withdraw this rejection and permit these claims to pass to allowance.

Additionally, as mentioned above, Applicants note that the filing date of the Ito reference is October 3, 2002, which is 28 days prior to the filing date of the foreign priority document (i.e., October 31, 2002) of the present application. Therefore, Applicants can swear behind the Ito reference by (1) perfecting Applicants' claim to foreign priority, and (2) filing a Declaration under 37 C.F.R. § 1.131 showing reduction to practice prior to the effective date of Ito, or alternatively, conception of the claimed invention coupled with diligence from just before the effective date of the Ito reference (i.e., October 3, 2002) to the constructive reduction to practice on the filing date of the present application's foreign priority document (i.e., October 31, 2002).

However, for the reasons set forth above, Applicants respectfully submit that Ito clearly does not anticipate the claimed invention. Therefore, Applicants submit that it should not be necessary to swear behind Ito to overcome this rejection. However, Applicants reserve the right to perfect the claim to foreign priority and to swear behind the Ito reference, should it become necessary, at a later time.

IV. NEW CLAIMS

New claims 7-21 are added to provide more varied protection for the elected invention of the present application.

Applicants submit that new claims 7-21 are patentable over the cited references for somewhat similar reasons as those set forth above, as well as for the additional features recited therein.

Therefore, the Examiner is requested to permit claims 7-21 to pass to immediate allowance.

V. FORMAL MATTERS AND CONCLUSION

The Examiner objects to the Title of the Invention. Applicants amend the Title to obviate this objection. Therefore, the Examiner is requested to withdraw this rejection.

The Examiner also objects to the drawings as allegedly not showing every feature of the invention specified in claims 1-3 (see also rejection of claims 1-3 under 35 U.S.C. § 112, second paragraph).

To ensure that all of the claimed features properly are shown in the drawings, Applicants request entry of new drawing Figure 6, which shows the elements set forth in original claims 1-3 (i.e., an electrode comprising a film including polycrystalline metal) and as described in the original specification (e.g., see specification at page 7, lines 8-25, page 8, lines 1-13). No new matter is added.

The specification correspondingly is amended merely to include reference numerals for the new Figure 6. The specification also is amended to correct minor errors.

The Examiner also objects to the drawings because the tables (i.e., Table 1 and Table 2 at pages 9 and 10 of the specification) allegedly should be included in the drawings (e.g., see Office Action at page 5, lines 1-2). However, Applicants note that the specification may contain tables in accordance with M.P.E.P. § 608.01 and 37 C.F.R. § 1.58(a). Thus, Applicants submit that no correction is necessary and request that the Examiner withdraw this objection.

Applicants also request that the Examiner accept and approve the Formal Drawings filed on March 9, 2004.

Applicants note that in the Notice of Cited References attached to the present Office Action, Item F incorrectly lists U.S. Patent No. 6,600,179B1 to Quaglietta et al. However, Item F should be U.S. Patent No. 6,600,178 B1 to Washio et al. Applicants respectfully request correction of the same so that the "References Cited" section of the resulting Patent properly includes this reference.


In view of the foregoing, Applicants submit that claims 1-3 and 7-21, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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AMENDMENTS TO THE DRAWINGS:

To ensure that all of the claimed features properly are shown in the drawings, Applicants request entry of new drawing Figure 6, which shows the elements set forth in original claims 1-3 (i.e., an electrode comprising a film including polycrystalline metal), as described in the original specification (e.g., see specification at page 7, lines 8-25, page 8, lines 1-13) and in original claims 1-3. No new matter is added. The specification correspondingly is amended to include reference numerals for the new Figure 6.

Attachments: New Drawing Replacement Sheet (1)